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14. Optometry

Northeastern State University

Abstracts from the 2016 Oklahoma Research Day

Held at Northeastern State University

05. Mathematics and Science

14. Optometry

05.14.01 Effective Management Techniques: Preparing for Private Practice

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ABSTRACT Purpose. Analysis of current practice management courses at 14 United States colleges of optometry was performed by conducting a survey. Data determined how effective methods prepared students for practice management in private practice. Results will assist practice management educators better prepare optometric students. Methods. A nine-question survey was conducted among optometrists who had graduated within the last ten years. Practice settings of subjects included private practice, corporate care, institutional (Veterans Affairs, Indian Health Services, military facilities), and academia. The survey was sent to American Optometric State Associations and U.S. Colleges of Optometry. Physicians ranked common instructional techniques according to the perceived benefit of each. Results. One hundred and nine current practicing optometrists participated. An average of two practice management courses are currently offered at U.S. Colleges of Optometry. A majority (52.29%) of participants' perceived being adequately prepared for private practice at their graduation, while 44.95% felt unprepared. Conclusion. The results of this study, based on the survey results and interpretation of multiple prior publications, concluded that effectively preparing optometry students for private practice includes utilizing different resources. The survey data revealed the most effective techniques analyzed were lectures by optometric guest speakers and business consultants.

05.14.02 InfantSEE: Scoping Out the National Application of This Public Health Program

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PURPOSE. Developed by the American Optometric Association, InfantSEE is a program that provides infants, ages 6 to 12 months, a no-cost, comprehensive eye exam to ensure adequate visual abilities. Untreated vision disorders can lead to developmental delays and learning barriers, contributing to poor school performance. Reasons behind those not participating in the program are explored in an effort to help guide the AOA in program improvements. METHODS. A 22 question survey was distributed to alumni of U.S. optometry schools and U.S. optometric state association members. The survey addressed InfantSEE providers and non-providers. RESULTS. 572 optometrists participated. 81.56% felt qualified to perform infant exams, but only 55.69% of participants are currently InfantSEE providers. The most prevalent reasons for not becoming providers were feeling that optometrists are devaluing the profession by not billing for services, current practice modality, and being uncomfortable in providing infant care. CONCLUSION. Many participants praised InfantSEE and how it helps children. Others criticized it due to it being a no-cost service, as well as lack of promotion and public awareness. Struggles persist with growing the program to support the 4 million babies born per year, keeping up with the Affordable Care Act changes, or continuing to educate optometrists on providing care to infants. We hope InfantSEE can utilize this information to continue program growth and development.

05.14.03 Water Intake Effect on Tear Osmolarity

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Introduction. Doctors recommend water intake to treat dry eye, assuming that whole body osmolarity affects tear osmolarity. This remains unproven and mechanisms for this process are unknown. Studies indicate that drinking water decreases plasma osmolarity and thereby tear osmolarity, but other research shows that plasma osmolarity is not easily altered. We hypothesize that increased water intake will not significantly decrease tear osmolarity within the first few hours. Methods. After overnight fasting from food and drink, we measured baseline tear osmolarity for both eyes of 20 subjects. They then consumed 30 oz of water within 30 minutes and TearLab measurements were repeated at 30 minutes, 2 and 3 hours post baseline. A modified SANDE questionnaire assessed symptoms before and after treatment. Results. No statistically significant change was found between baseline tear osmolarity and the two- and three-hour post-treatment measurements, however a significant decrease was observed immediately post-treatment. Subjective symptoms revealed no statistically significant change post-therapy. Conclusion. Following overnight fasting, reducing whole-body hydration to a minimum, the water dose caused a small transient decrease in tear osmolarity. However, within hours, homeostatic mechanisms returned osmolarity to baseline. Short-term whole body hydration did not produce a lasting improvement in tear osmolarity or subjective symptoms.

05.14.04 Effect of Lipid Based Artificial Tear Use on Hyperosmolarity

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We assessed and compared the efficacy of three commercial lipid based artificial tears at treating meibomian gland dysfunction by using TearLab tear osmolarity measurements as our primary diagnostic indicator in addition to the Ocular Surface Disease Index (OSDI), the TearScience SPEED Dry Eye Questionnaire and Oculus Keratograph meibomian gland assessments. We randomly assigned 45 participants, recruited from a pool of students, spouses of students, faculty, and staff at Northeastern State University Oklahoma College of Optometry, one of three lipid based artificial tears (Systane Balance, Refresh Optive Advance, or OcuSoft Retaine MGD) for use four times a day over the course of four weeks. At the first visit, subjects completed the OSDI and the Dry Eye Questionnaire. Meibomian gland assessment and baseline tear osmolarities of both eyes were obtained that visit. Subjects were then scheduled to return to the testing facility for a four-week follow-up visit to repeat the Dry Eye Questionnaire, obtain tear osmolarity values of both eyes and repeat meibomian gland assessment. We found no statistically significant difference between Systane Balance, Refresh Optive Advance, or OcuSoft Retaine MGD at decreasing tear osmolarity. All three lipid based tears showed an overall decrease in dry eye symptoms; this was further attributed to the placebo effect of using an eye drop. Meibomian gland structure stayed consistent throughout the one-month trial within all three study groups.

05.14.05 Spectacle wear and self-perception in children with accommodative dysfunction

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Purpose. To determine whether near variable-focus lens wear affects children's self-perception when compared to traditional, lined bifocal lenses for treatment of accommodative dysfunction. Methods. A randomized, single-masked trial was conducted. 10 subjects with accommodative dysfunction were randomly assigned to test groups for full-time spectacle wear: traditional, lined bifocal lenses and HOYA Sync near-variable focus lenses. Participants completed the Self-Perception Profile for Children prior to receiving lenses and after 45 days of full-time spectacle wear. Data was analyzed utilizing two-tailed paired t-tests. Outcomes included Global Self-Worth, Physical Appearance, Athletic Competence, Scholastic Competence, Behavioral Conduct, and Social Acceptance SPPC subscales. Results. Physical Appearance ($p<0.03$) was reduced following traditional, lined bifocal wear. Social Acceptance ($p<0.05$) was greater for near variable-focus lens wear. Physical Appearance ($p=0.16$) and Global-Self Worth ($p=0.35$) trended toward greater for near variable-focus lens wear. No other statistical differences or trends were identified. Conclusion. Individuals fit in near variable-focus lenses are likely to note improved physical appearance and social acceptance compared to traditional, lined bifocals. Eye care practitioners should consider the social consequences of prescribing lenses. Choosing the most appropriate vision correction for children may improve compliance.

05.14.06 Higher Order Aberrations in Air Optix Colors vs. Air Optix Aqua Soft Contact Lenses

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Purpose. The aim of this study is to compare higher order aberrations (HOAs) through Air Optix Colors and Air Optix Aqua using the Shack-Hartmann aberrometer. It is unknown what effect the color has on these contact lenses, but it is important to find out because they are the most breathable colored contacts on the market. Methods. Shack-Hartmann wavefront sensing technology with the Zeiss i.Profiler®plus was used to measure HOAs present in the two eyes of 15 subjects while wearing Air Optix Aqua contact lenses and comparing that to Air Optix Colors. These measurements took place with a natural pupil and a 3mm and 5mm analyzing standard was used when gathering data. Total HOA Root Mean Square (RMS) values were used to compare statistical significance between the two lenses. Results. Air Optix Colors lenses induced a higher statistically significant amount of HOAs when compared to Air Optix Aqua. Discussion. The statistics found a significantly increased amount of HOAs induced by the Air Optix Colors contact lenses when compared to their clear counterpart. Further studies that include other subjective testing such as visual acuity, contrast sensitivity, scotopic vision, color vision, and patient feedback are needed to assess clinical significance.

05.14.08 Correlation Between Gastrointestinal Disorders and Glaucoma

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We compared glaucoma patients with non-glaucoma patients to determine if there was a correlation between glaucoma and gastrointestinal disorders. Risk factors have been theorized, but the exact mechanisms of glaucoma are still unknown. One mechanism that has not been fully researched is the bi-directional communication between the gut and the brain. Through this pathway, gastrointestinal disorders may be contributing to the pathology of neurodegenerative diseases like glaucoma. We conducted a chart review in the Northeastern State University Oklahoma College of Optometry's electronic health record system, Compulink. This review consisted of 81 randomly selected glaucoma patients with 81 non-glaucoma patients. The differences between sets was evaluated using an odds ratio and a Pearson's chi square. Of the glaucoma subjects, 25.9% had IBD or a related medication and of the control group, 22.2% had IBD or a related medication. Following the statistical analysis of the data, the risk of having irritable bowel disease (IBD) was slightly higher for the subjects with glaucoma but was not statistically significant. These findings indicate further research is indicated to study the role the bi-directional pathway between the gastrointestinal system and the central nervous system plays in glaucoma.

05.14.09 Effect of Sodium Consumption on Tear Osmolarity Measurements

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Purpose. The purpose of our research was to preliminarily test whether ingesting a meal containing higher than normal dietary salt quantity than what is recommended by the World Health Organization would significantly alter tear osmolarity as measured by the TearLab® instrument. We hypothesize increasing systemic levels of sodium will also increase tear film sodium postprandial, thus increasing tear osmolarity. Methods. Initial tear osmolarity measurement (preprandial) was taken on each eye of the subject. The subject then consumed the provided high sodium meal. Additional measurements were taken postprandial at thirty minutes, two hours, and three hours on each eye. Subjects self-reported current height and weight. A standard BMI equation was used to calculate each subject's BMI. Results. Average tear osmolarity decreased over time and reached minimum value at 2 hour postprandial instead of increasing as expected. Overall, there was no significant difference between preprandial and postprandial measurements. Subjects with higher BMI values had higher than average tear osmolarities. The high BMI subgroup also had a significant change in tear osmolarity over time. Conclusion. Tear osmolarity seems to be affected by dietary sodium consumption, though opposite than hypothesized. Increasing dietary sodium intake is not a valid treatment option for DED; however, decreasing an individual's BMI may decrease a person's tear osmolarity which may decrease the com

05.14.10 Settling Time of Two Jupiter™ Scleral Lens Diameters

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Purpose. As scleral lens designs gain popularity, it is important to have more standardized methods for evaluating lens fit and to better understand lens settling rates and amounts in order to more efficiently fit these lenses. This study will evaluate the settling rates for two diameters of Jupiter™ lenses. Methods. A study of Jupiter™ lens settling in 15.6mm and 18.2mm diameters was performed. Subjects were fit using fitting sets in the NSUOCO contact lens clinic. One eye of each subject was fitted with each scleral lens designs over separate visits. After inserting lenses into each patient's left eye, settling amounts were measured at 3 minutes, 15 minutes, 30 minutes, 45 minutes, 1 hour, 2 hours, 4 hours, and 8 hours. Clearance values were measured using a Zeiss Visante™ Optical Coherence Tomographer. Results. On average the Jupiter™ 15.6 design and Jupiter™ 18.2 design settled a total of 73.3 µm and 120 µm, respectively. The majority of lens settling occurred between initial lens insertion and the 4-hour measurement. Conclusion. Settling time varies between lens designs. It is difficult to precisely predict the amount of settling each lens will have due to differences in the corneo-scleral junction. Our study and data analysis shows a majority of settling occurs between initial fit and the 4-hour measurement. Settling does still occur after the 4-hour time, and will likely occur throughout the wearing of a lens.

05.14.11 Visioffice Interpupillary & Segment Height Measurements vs Traditional Methods

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Popularity of free-form lenses has increased the need for more precise positioning of spectacle lenses. The purpose of this study was to determine the comparability and repeatability of the Essilor Visioffice system's interpupillary (PD) and segment height measurements to gold standard methods. Thirty optometry school participants were enrolled and measured. Investigators measured binocular and monocular PDs by mm ruler and pupillometer. Their seg heights, for right eye only, were measured using a mm ruler. All measurements were then repeated using the Visioffice system. Measurements were repeated three times on all participants. For this study the corneal reflex pupillometer and mm ruler were considered the gold standard for PD measurements and seg height measurements, respectively. A standard, pre-adjusted frame was used on all patients. Bland-Altman analysis of the binocular PD measurements was performed. The intra-class correlation coefficient (ICC), a measure of repeatability, was 0.99 for the monocular PD measurements using the Visioffice (OD, OS). They were 0.98 and 1.0 for the pupillometer, OD and OS respectively. There was not a statistically significant difference between seg height measurements by the Visioffice and mm ruler by paired t-testing ($p=0.13$). Neither the Visioffice nor mm ruler provided repeatable measurements of seg height.

05.14.12 Decreased Parvocellular Input and Its Effects on Depth Perception

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Purpose. This experiment was conducted in an attempt to better understand the magnocellular pathway's function as it relates to humans' ability to coordinate vision and to accurately interact with an object in space. By blocking the subject's central vision, we decreased the input from the parvocellular pathway, allowing us to study the magnocellular system as the primary system used for judging the distance and spatial location of a target. Methods. Subjects were asked to toss a beanbag into a bucket from 10 feet away, 10 times with central vision occluded and 10 times without any occlusion. Subjects were randomized into two groups, one who performed the task with central occlusion first, and another who performed it without central occlusion first. Our experimental group consisted of 17 subjects. Results. Our results showed no significant difference in performance between the trial with central occlusion and the trial without central occlusion. Conclusion. Although our subjects' performance was essentially the same with and without central occlusion, this may be either (a) a result of small sample sizes, or (b) subjects may have used primarily magnocellular input whether or not central vision was blocked. Further studies are needed, possibly including trials with peripheral vision occluded, to determine whether this is the case.